

Radiation Resistant, Reconfigurable, Shape Memory Metal Rubber Space Arrays, Phase I

Completed Technology Project (2010 - 2011)



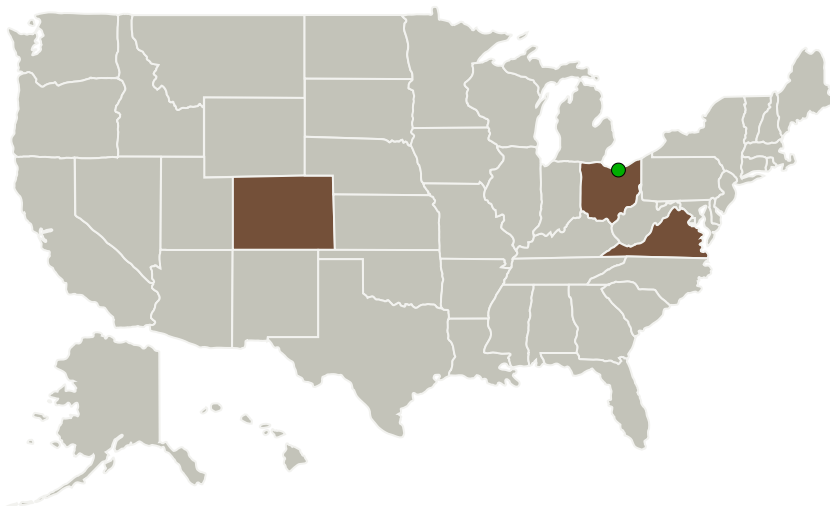
Project Introduction

NanoSonic has demonstrated that Shape Memory Metal Rubber

TM

(SM-MR) adaptive skins exhibit reconfigurable and durable RF properties. It is hypothesized that such morphing skins shall also exhibit durable radiation resistance upon morphing; a property that few, if any, flexible materials offer. Typical highly filled or metal evaporated nanocomposites crack and spall upon flexation, and cannot be repeatedly mechanically stretched without rupture after a few cyclic strains. SM-MR nanostructured morphing materials are based on self-assembled high z, dense, Au and Ag nanoparticles, rather than Pb. Our manufacturing process yields tough skins that can be repeatedly and severely mechanically morphed without loss of EMI shielding (-88dB). NanoSonic, together with Colorado State University, have demonstrated that SM-MR is up to 50% lighter in weight and provides greater gamma ray attenuation relative to commercial off-the-shelf shielding materials, without emitting harmful secondary radiation under a ¹³⁷Cs source. During Phase I, radiation shielding would be verified for SM-MR during potential disparate space array morphed configurations to demonstrate durability, stowability, and reconfigurability for space tolerant structures with self-healing properties to reach TRL6. TRL8 and 9 shall be reached during Phase II and III with assistance from our space systems prime partner upon flight testing and integration.

Primary U.S. Work Locations and Key Partners



Radiation Resistant,
Reconfigurable, Shape Memory
Metal Rubber Space Arrays,
Phase I

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Organizations Performing Work	Role	Type	Location
Nanosonic, Inc.	Lead Organization	Industry	Pembroke, Virginia
Colorado State University-Fort Collins	Supporting Organization	Academia	Fort Collins, Colorado
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations

Colorado	Ohio
Virginia	

Project Transitions

▶ **January 2010:** Project Start

✓ **January 2011:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/139367>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Nanosonic, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

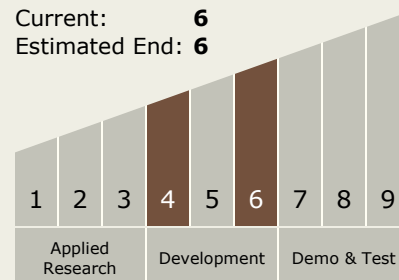
Carlos Torrez

Principal Investigator:

Jennifer H Lalli

Technology Maturity (TRL)

Start: 4
Current: 6
Estimated End: 6



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.2 Structures
 - └ TX12.2.5 Innovative, Multifunctional Concepts

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System